5.6 MITIGATION MEASURES

The regulations promulgated by the CEQ to implement the procedural provisions of NEPA (42 U.S.C. §4321) require that an EIS include a discussion of appropriate mitigation measures (40 CFR §1502.14[f] and 16[h]). The term "mitigation" includes the following (40 CFR §1508.20):

- Avoiding an impact by not taking an action or parts of an action
- Minimizing impacts by limiting the degree or magnitude of an action and its implementation
- Rectifying an impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact by preservation and maintenance operations during the life of the action
- Compensating for the impact by replacing or providing substitute resources or environments

This section describes mitigation measures by resource area, along with descriptions and key proactive initiatives. These mitigation measures and proactive initiatives address the range of potential impacts of the Proposed Action.

5.6.1 Defining Mitigation Measures

NNSA and LLNL operate under existing laws, programs, and controls, including regulations, policies, and contractual requirements. A list of laws, categorized by resource area, is presented in Chapter 7 of this LLNL SW/SPEIS. LLNL has numerous existing procedures that provide controls to mitigate potential impacts. Examples include the ES&H Manual, emergency plans, ISMS, Cultural Resources Management Plan, several protected species programs, and energy conservation and water reduction programs. In general, these procedures and controls effectively reduce the need for additional mitigation measures for resource areas evaluated in the LLNL SW/SPEIS.

This section summarizes potential impacts determined for each resource area and highlights major applicable laws, programs, procedures, and controls. If impacts are determined to be significant, mitigation measures are presented. Mitigation measures that are part of existing procedures and controls are not repeated. A more detailed description and implementation plan would be presented in a mitigation action plan published following the ROD. Agreements may be revised or amended based on future circumstances or changes in regulatory requirements.

5.6.2 Land Uses and Applicable Plans

LLNL does not plan to buy, sell, or transfer any property under the No Action Alternative, Proposed Action, or the Reduced Operation Alternative. All new construction would occur within the Livermore Site and Site 300, and the new facilities would be used for office space or R&D, as are all facilities at LLNL. Thus, there would be no changes in land use at LLNL, and no conflict with existing and approved future land uses adjacent to the site. Therefore, no additional mitigation measures would be required.

5.6.3 Socioeconomic Characteristics and Environmental Justice

The alternatives analyzed would cause changes in employment at LLNL ranging from a 5 percent increase under the Proposed Action to an 8 percent decrease under the Reduced Operation Alternative, as compared to the No Action Alternative. Commensurate changes in

LLNL direct expenditures, employee expenditures, and housing demand would result primarily within Alameda, San Joaquin, Contra Costa, and Stanislaus counties. Because of the large regional economy and the relatively small changes in employment under the alternatives, there would be minimal socioeconomic impacts from implementation of any alternative; no mitigation measures would be required.

LLNL operations analyzed would have minimal impact to resource areas analyzed, including human health effects to offsite residents or onsite workers. Therefore, no disproportionately high and adverse impacts to minority or low-income populations are anticipated and no mitigation measures would be required.

5.6.4 Community Services

LLNL operations under the alternatives analyzed would have minimal impact to the ability of nearby communities to provide fire protection, emergency services, police protection, school services, and nonhazardous solid waste disposal. The limited increase in the potential number of new laboratory workers would have minimal impact. Therefore, no mitigation measures would be required.

5.6.5 Prehistoric and Historical Cultural Resources

Mitigation measures to address impacts to prehistoric and historic cultural resources resulting from proposed LLNL activities are specific to each circumstance. The measures are determined by a number of factors, including the nature of the resource, the location of the resource, and the nature of the proposed activity. The Programmatic Agreement (see Appendix G) between NNSA, University of California, and the California SHPO describes the process to be followed to determine if specific proposed activities conducted at LLNL would have an effect on important prehistoric or historic cultural resources. If it is determined that a resource would be adversely affected, the Programmatic Agreement describes the process to be undertaken to address that impact, which can result in specific actions to avoid, reduce, or mitigate the adverse effect.

Unanticipated effects to resources can occur when previously unknown resources, namely subsurface cultural remains, are discovered during the activity. The Programmatic Agreement also addresses these "discovery" situations. It is unlikely that subsurface remains are present at the Livermore Site due to the disturbed nature of the area. Because of the undisturbed nature of Site 300, there is a greater potential for subsurface remains. If such remains are encountered during ground-disturbing activities, work within the immediate vicinity of the discovery would cease until consultation between NNSA and SHPO regarding the discovery has been completed. Through that consultation, a determination would be made of the resource's importance, the extent of the effect, and appropriate actions required to avoid, reduce, or mitigate further adverse effect. The inadvertent discovery of Native American human remains or funerary objects (associated or unassociated) on LLNL would require adherence to the *Native American Graves Protection and Repatriation Act* (25 U.S.C. §3001).

No traditional cultural properties or Native American sacred sites have been identified on the Livermore Site or Site 300. If any are identified in the future, access to these properties or sites could become restricted. If access is desired, NNSA would consult with the appropriate Native American tribe to develop an agreement or procedures for access to the particular site.

5.6.6 Aesthetics and Scenic Resources

No impacts to aesthetics or scenic resources would occur under any of the alternatives addressed in this LLNL SW/SPEIS. Maintaining the visual quality of LLNL is accomplished through adherence to the Landscape Architecture Master Plan (LLNL 2002d). This Plan helps to create a cohesiveness of image for LLNL, and is intended to ensure that all site improvements are compatible with their immediate surroundings and that aesthetic qualities are enhanced. Any changes to LLNL and its built environment under the alternatives would be conducted in compliance with this Plan. Therefore, no additional mitigation measures would be required.

5.6.7 Geology and Soils

No known aggregate, clay, coal, or mineral resources would be adversely affected by any of the alternatives at either the Livermore Site or Site 300. None of the activities proceeding under any of the alternatives would take place near or upon any known or exploitable mineral resources, unique geologic outcrops, or other unique geologic features. None of the alternatives would impact farming or grazing. No mitigation measures would be required.

Under the alternatives analyzed, several facilities would be built in the undeveloped areas at the Livermore Site. A total of 700,000 square feet would be disturbed as a result of the construction that would proceed under the Proposed Action, including 240,000 square feet under the No Action Alternative. The soils that would be disturbed are not considered prime farmlands nor are they used for agriculture. Best management practices would be used to control runoff and soil loss. No additional mitigation measures would be required.

Under all of the alternatives, the wetland enhancement, described in Section 5.6.8, would involve the disturbance of 1.09 acres of soils at Site 300. Additionally, under the Proposed Action, approximately 33,000 square feet of previously undisturbed soils would be disturbed by the construction of the 40,000-square-foot EMPC. No additional mitigation measures would be required for disturbance of these soils.

5.6.8 Biological Resources

At the Livermore Site, measures would be taken to protect the California red-legged frog during Las Positas Arroyo Maintenance Project activities, as described in previously approved plans and the USFWS Biological Opinion (LLNL 1998a, USFWS 1998). These measures are summarized in Appendix E. A Bullfrog Management Program at the Livermore Site would continue to minimize the adverse impact of this known predator species of the California red-legged frog. A detailed description of this program coordinated with and approved by the USFWS is also provided in Appendix E. No additional mitigation measures would be required.

For Site 300, LLNL is proposing to mitigate the 0.62-acre artificial wetland, removed by continued operations at Site 300 under the No Action Alternative, Proposed Action, and Reduced Operation Alternative, by enhancing selected areas and increasing breeding opportunities for the California red-legged frog. A minimum of 1.86 acres (i.e., 3:1 replacement ratio) of wetland habitat would be enhanced and managed for these two species. Mitigation sites for enhancement include the wetlands at Mid Elk Ravine and the seep at the SHARP Facility. This mitigation measure has been previously addressed in a Biological Assessment and related Biological Opinion (Jones and Stokes 2001, USFWS 2002b). See Appendix E, Section E.2.1.9, for more information.

Measures to minimize impacts to the Alameda whipsnake at Site 300 are contained within a recent Biological Assessment and Biological Opinion (Jones and Stokes 2001, USFWS 2002b). Mitigation measures to minimize impacts to the California tiger salamander are provided in Appendix E. Continuing or proposed new activities at Site 300 are not anticipated to adversely affect the large-flowered fiddleneck, San Joaquin kit fox (which has not been observed since at least 1986), or the valley elderberry longhorn beetle as discussed in Appendix E. Therefore, no additional mitigation measures would be required.

5.6.9 Air Quality

Both the Bay Area and San Joaquin air basins are designated as nonattainment areas for ozone and respirable-sized particulates (PM_{10}). Because of this designation, emissions of particulate matter and ozone precursors such as oxides of nitrogen and precursor organic compounds are strictly regulated. Both the BAAQMD and SJVUAPCD have enacted "no net increase" programs, and are required to implement all feasible measures to reduce emissions of these pollutants. These include measures to control emissions from stationary sources (industrial, commercial, government, and research facilities), and offset any proposed increase in emissions by an equal or greater reduction in emissions. Site 300 is rated as a small source, and is not subject to offset requirements, which are generally placed on larger emitting sources. The Livermore Site is a mid-sized facility eligible for participation in BAAQMD's offset management program.

LLNL has mitigation measures in place governing construction activities and fuel use to minimize air emissions including: water spraying of disturbed areas and covering exposed piles of excavated material; engineering controls, devices, and work practices during work with asbestos to isolate the source of asbestos and prevent fiber migration; and requirements that construction equipment and vehicles be inspected daily for leaks of fuel, engine coolant, and hydraulic fluid.

LLNL has a transportation systems management program that provides and promotes alternative, environmentally responsible, options for employee commuting, assists LLNL in complying with transportation-related *Clean Air Act* legislation, and resolves congestion management issues (LLNL 2001s). LLNL would continue this program. No additional mitigation measures would be required.

5.6.10 Water

Water resources could be degraded by contaminant releases during construction of some facilities. Contaminant sources include construction materials; hydraulic fluid, oil, and diesel fuel; and releases from transportation of waste handling accidents. If a spill occurred, LLNL stormwater pollution prevention plans are in place to identify pollutant sources that affect the quality of industrial stormwater discharges and to describe implementation practices to reduce pollutants in the discharges. Necessary equipment to implement cleanup is available, and personnel are trained in proper response, containment, and cleanup of spills. Further guidance on response to hazardous material spills is provided in the ES&H Manual.

Compliance with the California General Construction Stormwater NPDES Permit (or other individual NPDES permit) for construction projects disturbing one acre or more, including developing and implementing a project-specific stormwater pollution prevention plan, would minimize impacts to surface waters from construction-induced erosion.

LLNL will continue to remove contaminants from groundwater and unsaturated zones (soil vapor) through a series of treatment facilities at the Livermore Site and Site 300. Groundwater quality should continue to improve because extracted groundwater will be collected and treated at the treatment facilities. No additional mitigation measures would be required.

5.6.11 Noise

At the Livermore Site, noise-generating activity levels and conditions are not expected to be significantly different from the No Action Alternative. With the relatively large spatial area and perimeter buffer zone, noise from most activities would not be expected to be discernible in offsite areas. Noise levels are not expected to conflict with land use guidelines, or adversely impact the offsite community. No additional mitigation measures would be required.

At Site 300, LLNL plans to continue high explosives research testing within the Contained Firing Facility and on open firing tables. The number of blasts and intensity are not expected to change, and therefore, impacts would be the same as the No Action Alternative. LLNL would continue to use blast forecasting as a tool to determine if explosive tests would adversely impact the surrounding community, and to restrict operations when peak impulse noise levels are predicted to exceed the 126 dB(A)-level in populated areas. LLNL would continue to perform meteorological monitoring to provide necessary input data for blast forecasting (LLNL 2001s). No additional mitigation measures would be required.

5.6.12 Traffic and Transportation

The traffic impacts for the No Action Alternative, Proposed Action, and Reduced Operation Alternative are not likely to be measurably different. Onsite and offsite radiological transportation impacts are very small, much less than one LCF over the period of analysis. NNSA will continue to conduct transportation operations in accordance with Federal and state regulations and will maintain procedures to ensure operations are safe, with radiological doses will be ALARA. Accordingly, no additional mitigation measures would be required.

5.6.13 Utilities and Energy

LLNL utilities and energy infrastructure is capable of accommodating demand under any of the alternatives. No mitigation measures would be anticipated.

Energy consumption is a particular concern in California based on past energy shortages. The California Independent System Operator forecasts adequate resources available to meet forecasted power demand and meet minimum operating reserves. The Independent System Operator also anticipates that the transmission should demonstrate adequate reliability performance during the projected peak demand periods. No mitigation measures beyond the energy management practices described in Appendix O would be required.

5.6.14 Materials and Waste Management

Under the Proposed Action, there would not be any major changes in the types of waste streams generated or materials used at LLNL. Waste generation projects would not exceed waste treatment and disposal capacities. Waste would continue to be managed in accordance with existing Federal and state regulations and with DOE/NNSA orders and guidance, and LLNL procedures. Therefore, waste management operations would be conducted in a manner to ensure protection of the environment and the safety of LLNL workers. LLNL has a waste minimization and pollution prevention program, described in Appendix O. This program has been effective in

reducing the levels of waste generation and has established goals for future reductions of waste levels. No additional mitigation measures would be required.

5.6.15 Human Health and Safety

Under the No Action Alternative, the occupational worker dose would be 90 person-rem per year. This includes new facilities coming on line such as the NIF, and increased activities in the Superblock. The Proposed Action increases the total occupational dose to 125 person-rem per year, with the largest increase coming from the ITP. The Reduced Operation Alternative occupational worker dose would be 38 person-rem per year. Adverse human health effects to LLNL employees are not expected under any of the alternatives. Annual LCFs calculated for these levels of exposure are 0.054, 0.075, and 0.023, under the No Action Alternative, Proposed Action, and Reduced Operation Alternative, respectively.

LLNL has an ALARA program to minimize worker dose. Worker exposures are reviewed and trended quarterly. These trends provide the basis for control measures such as automating processes, adding remote operations, changed administrative procedures, and shielding improvements. Worker doses are monitored at frequent periods and evaluated to ensure that ALARA goals are being achieved or that timely corrective action is required.

It is the policy of DOE/NNSA and LLNL to operate in a manner that protects the health and safety of employees and the public. ES&H is a priority consideration in the planning and execution of all work activities at LLNL. LLNL complies with applicable ES&H laws, regulations, and requirements, and with directives promulgated by DOE regarding ES&H. LLNL ISMS provides a formal, organized process whereby LLNL personnel plan, perform, assess, and improve the safe conduct of work. The system defines a process for identifying, planning, and performing work that provides for early identification of hazards and associated control measures for hazards mitigation or elimination. The ISMS process also forms the basis for work authorization and provides for both internal and external assessment that provides a continuous feedback and improvement loop for identifying both shortcomings and successes for incorporation into subsequent activities. No additional mitigation measures would be required.

5.6.16 Site Contamination

Continued operation of LLNL under any of the alternatives carries the possibility of soil contamination and subsequent groundwater contamination; however, LLNL operational procedures minimize this potential. LLNL is required to continue its cleanup of existing contamination at both the Livermore Site and Site 300. Groundwater treatment and soil vapor extraction systems are in place to achieve these requirements. These systems will continue operation under the alternatives. Other than implementation of LLNL operational procedures, continued remediation, and cleanup milestones and goals already committed to by NNSA, no additional mitigation measures would be required.

5.6.17 Accidents

As detailed in Section 5.5, Bounding Accident Scenarios, there are postulated chemical and radiological accidents that potentially could result in onsite and offsite consequences. These accidents are similar for all alternatives. Management controls in the form of facility and operational safety procedures are used to minimize the probability of an accident and to reduce its consequences. However, in the event of an accident, LLNL has detailed response plans to further mitigate both the onsite and offsite consequences. DOE has developed an ISMS, a comprehensive

approach to improving safety. The ISMS includes: defining the scope of the work, identifying the hazards, establishing suitable controls, safely performing the work, and providing feedback for improvement. This ISMS is described in detail in Appendix C. The response activities would be closely coordinated with those of appropriate offsite emergency response organizations. Refer to Appendix I, Emergency Planning and Response, for further details. LLNL personnel are trained and drilled in the protective actions to be taken if a release of radioactive or toxic material should occur. These protective actions comply with protective action guides established by EPA (see Appendix I). The underlying principle for the protective action guides is that under emergency conditions all reasonable measures should be taken to minimize the radiation and chemical exposure to the general public and emergency workers. No additional mitigation measures would be required.

5.6.17.1 *Emergency Response and Protective Actions*

LLNL has detailed plans for responding to accidents of the type described here, and the response activities would be closely coordinated with those of local communities such as Alameda County. LLNL personnel are trained and drilled in the protective actions to be taken if a release of radioactive or otherwise toxic material occurs. Refer to Appendix I for further details on LLNL emergency planning and response information.

Protective Action Guide

A predetermined projected dose level at which specified actions should be taken to protect the public from exposure to radiation.

The underlying principle for the protective action guides is that under emergency conditions all reasonable measures should be taken to minimize the radiation exposure of the general public and emergency workers. In the absence of significant constraints, protective actions could be implemented when projected doses are lower than the ranges given in the protective action guides. No credit was taken from emergency response and protective actions in the consequence analysis. No additional mitigation measures would be required.

5.6.17.2 *High Efficiency Particulate Air Filtration*

In all areas where unconfined plutonium or other radioactive materials can be handled and can exist in a dispersible form, HEPA filters provide a final barrier against the inadvertent release of radioactive aerosols into the outside environment. However, these filters would not trap volatile fission products such as the noble gases and iodine; such gases would be released into the outside environment.

HEPA filter efficiencies are 99.99 percent or greater with the minimum efficiency of 99.97 percent for 0.3 micron particles, the size most easily passed by the filter. To maximize containment of particles and provide redundancy, two HEPA filters in series are used. Actual data from HEPA filter replacement records in Building 332 show that none of the filters used to prevent a potential for release of plutonium to the atmosphere have degraded to the overall efficiencies assumed for the accident scenarios (LLNL 2003t). These HEPA filters are protected by building design features against the consequences of an earthquake or fire. Credit was taken for filtration in the consequence analysis when ventilation and building containment were shown by analysis to survive during the accident.